

# SONY®

## White paper

June 2013



# Xperia™ C

S39h

Note: Screen images are simulated.

# Purpose of this document

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Sony Mobile Communications product White papers are intended to give an overview of a product and provide details in relevant areas of technology.

## Document history

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Version		
June 2013	First released version	Version 1
July 2013	Second released version	Version 2
July 2013	Third released version	Version 3

## Sony Mobile Developer World

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For the latest technical documentation and development tools, go to [www.sonymobile.com/developer](http://www.sonymobile.com/developer).

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# Product overview

## Xperia™ C highlights

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- Dual SIM smartphone with 5-inch qHD display
- 8MP camera with Exmor R® for mobile and HDR
- Take stunning self-portraits using a voice-guide
- Powerful 1.2 GHz Quad-core processor with 1GB RAM
- “WALKMAN” app with Sony audio enhancement technology and integrated services

### Big screen entertainment

From awesome film clips to beautiful vacation memories, whatever you're watching, the 5-inch 540 x 960 qHD display on the Xperia™ C creates a viewing experience aimed to give you goose bumps. Together with a powerful 1.2 GHz Quad-core processor and 1GB of RAM, this smartphone offers super-fast performance as well as astonishing graphics.

### Beautiful images, always...

The Xperia™ C was created using the same expertise and components as leading Sony cameras. It comes with an 8 MP camera with Exmor R® for mobile, which lets you take great pictures, even in challenging light conditions. And with HDR, your subject looks as bright as you remember, even when back lit. The Xperia™ C also has a dedicated camera key that can use to shoot from a locked screen as well as a fast-capture function that goes from sleep to snap in under one second.

### Capture and share the most beautiful version of you

Want your picture taken by a professional? Well, with the Xperia™ C you'll get pretty close. Switch on the self-portrait function and the intelligent voice guide will tell you where to move, making sure your face fits the frame perfectly. This way, you take pictures using the main camera, meaning the quality will always be superb. But wait, there's more. You can turn on Beauty mode and make that portrait absolutely flawless. For a picture perfect you – every time.

### Music to lose yourself in

Can't live without the sound of the latest music in your ears? The “WALKMAN” app lets you customise your music experience to a new level. Create playlists and enjoy crisp and clear sound quality with ClearAudio+ mode\*, which includes Sony's unique audio enhancement technologies. Combine with your favourite music service, and get the music experience you so rightfully deserve.

\* Requires ClearAudio+ certified headset.

## A better way to handle your calls – dual SIM cards

With dual SIM cards, it's easier to separate work from play – and handle calls more cost-efficiently. You can simply switch between SIM cards anytime with a simple touch. Or make the switch happen automatically: just preset which SIM card to use at specific times of the day. You can also customise each SIM card separately. Choose a formal ring signal during office hours, then go for a more casual one at home.



NOTE: Screen images are simulated.

## Facts – dimensions, weight, performance and networks

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Operating system	Google™ Android™ 4.2.2 (Jelly Bean)
Processor	1.2 GHz MTK6589 quad-core
GPU	IMG SGX544
Size	141.5 x 74.15 x 8.88 mm
Weight	153 grams
Available colours	Black White Purple
Main screen	
Colours	16,777,216 colour TFT
Resolution	960x540 pixels
Size (diagonal)	5 inches
Scratch-resistant	Yes – Touch panel cover glass (Schott 2nd source)
Input mechanisms	
Text input	On-screen QWERTY keyboard, 12-key input
Touch screen	Capacitive
Touch gesture	Yes – multi-touch, up to 4 fingers supported
Handwriting recognition	Yes
Memory	
RAM	1 GB
Flash memory	Up to 4 GB*
Expansion slot	microSD™ card, up to 32 GB
Camera	
Camera resolution	8 MP
Digital zoom	4x
Photo flash	Yes – Pulsed LED
Video recording	Yes – Full HD 1080p
Front camera	Yes – VGA
Sensors	
Accelerometer	Yes
Ambient light sensor	Yes

Proximity sensor	Yes
Magnetometer	Yes
Networks	
S39h	UMTS HSPA+ 900 (Band VIII), 2100 (Band I) MHz GSM GPRS/EDGE 900, 1800, 1900 MHz
Data transfer speeds	
GSM GPRS	Up to 85.6 kbps (download). Up to 85.6 kbps (upload).
GSM EDGE	Up to 237 kbps (download). Up to 237 kbps (upload).
UMTS HSUPA (upload)	Up to cat 7 (11.5 Mbps)
UMTS HSDPA (download)	Up to cat 24 (42 Mbps)
Talk time (GSM)	Up to 10 hours 3 min.**
Standby time (GSM+GSM)	Up to 588 hours**
Talk time (UMTS)	Up to 10 hours 3 min.**
Standby time (UMTS+GSM)	Up to 605 hours**
Music listening time	Up to 53 hours 59 min.**
Video playback time	Up to 10 hours 32 min.**
Battery (Removable)	2390 mAh, typical 2330 mAh, minimum







\* Memory comprises approximately 1.2 GB of firmware, plus 2.0 GB of “Internal Storage” for downloaded applications, music, pictures and movies, and some application data. For more details about memory, see “Memory in Android™ Device” on page 15.

\*\* Values are according to GSM Association Battery Life Measurement Technique as performed in controlled laboratory conditions. Actual time may vary.

NOTE: Battery performance may vary depending on network conditions and configurations, and phone usage.




NOTE: All performance metrics are measured under laboratory conditions.

## Categorised feature list

 <p><b>Camera</b>        8 megapixel camera        4x digital zoom        Auto focus        Face detection        Flash/Photo flash        Front-facing camera (VGA)        Geotagging        Self-timer        Send to web        Smile Shutter™        Video stabiliser        Sweep Panorama        Touch capture        Touch focus        Video light        Video recording (Full HD 1080p)</p>	 <p><b>Music</b>        3D Surround Sound (VPT)        Album art        Bluetooth™ stereo (A2DP)        ClearAudio+        Clear bass        Clear Phase™        Clear stereo        Dynamic normalizer        Manual equalizer        PlayNow™ service*        TrackID™ music recognition*        “WALKMAN” application        xLoud™ Experience</p>	 <p><b>Internet</b>        Bookmarks        NeoReader™ barcode scanner*        Web browser (WebKit™)</p>
 <p><b>Communication</b>        Call list        Conference calls        Speakerphone        Video chat ready</p>	 <p><b>Messaging</b>        Conversations        Email        Handwriting recognition        Instant messaging        Multimedia messaging (MMS)        Predictive text input        Text messaging (SMS)</p>	 <p><b>Design</b>        Auto rotation        Illumination effect        On-screen 12-key keyboard        On-screen QWERTY keyboard        Picture wallpaper        Screen capturing        STAMINA mode        Touch screen        Voice input        Wallpaper animation</p>

\* This service is not available in all markets.



 <p><b>Entertainment</b>            3D games            Media browser            Motion gaming            Radio (FM radio with RDS)            Video streaming</p>	 <p><b>Organiser</b>            Airplane mode            Alarm clock            Calculator            Calendar            Contacts            Document readers            eCompass™            Notes            Setup guide            Stopwatch            Timer            World clock</p>	 <p><b>Connectivity</b>            3.5 mm audio jack (CTIA)            Bluetooth™ 4.0 wireless technology            Media Transfer Protocol support            Micro USB support            Native USB tethering            Media Go™*            PC Companion            Play Anywhere™            Screen mirroring            Smart Connect            Synchronisation via SyncML™            Synchronisation with computer            Synchronisation via Microsoft® Exchange ActiveSync®            USB High speed 2.0 support            USB mass storage            Xperia Link™            Wi-Fi®            Wi-Fi Direct™            Wi-Fi® Hotspot functionality</p>
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\* This service is not available in all markets.

# Technologies in detail

NOTE: The information outlined below is general and levels of compliance to standards and specifications may vary between products and markets. For more information, contact Sony Developer World or your Sony contact person where applicable.

## Device-to-device communications (local)

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### Bluetooth™ wireless technology

Bluetooth™ profiles supported	Advanced Audio Distribution Profile v1.2 Audio/Video Remote Control Profile v1.3 Generic Attribute Profile Client/Server over LE Handsfree Profile v1.6 (Wide-band speech) Headset Profile v1.2 Human Interface Device Profile v1.0 Object Push Profile v1.2 Personal Area Networking Profile v1.0 FTP v1.2 (server role) DUN 1.1
Core version and supported core features	Version 4.0
Connectable devices	Products supporting at least one of the profiles above. BT4.0 accessories generally require installation of a supporting application.

More information:

[www.sonymobile.com/developer](http://www.sonymobile.com/developer)

[www.bluetooth.com](http://www.bluetooth.com)

**Wi-Fi®**

Supported standards	IEEE 802.11 b/g/n and Wi-Fi® Wi-Fi Direct®, Wi-Fi Protected Setup
Connectable devices	Wi-Fi® access points Wi-Fi Direct compatible devices
Frequency band	2.4 GHz
Data transfer rate	Up to 150 Mbit/s
Security	Open Authentication Shared Authentication EAP-SIM EAP-AKA EAP-TLS EAP-TTLS/MSCHAPv2 PEAPv0/EAP-MSCHAPv2 PEAPv1/EAP-GTC WPA Personal and WPA2 Personal WPA Enterprise and WPA2 Enterprise
Encryption	WEP 64 bit, WEP 128 bit, TKIP and CCMP (AES)
Power save	WMM-UAPSD QoS, WMM

## Messaging

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### MMS (Multimedia Messaging Service)

According to OMA Multimedia Messaging Service v1.0 + SMIL

### Email

Bearer type (IP)	GPRS, EGPRS, UMTS, Wi-Fi®
Character sets	BIG5 Traditional Chinese GB2312 Simplified Chinese GB18030 ISO-2022-JP Japanese ISO-8859-1 ISO-8859-2 Eastern Europe ISO-8859-5 Cyrillic ISO-8859-7 Greek ISO-8859-9 Turkish ISO 8859-11 KOI8-R Cyrillic Shift_JIS Japanese USASCII UTF-16 UTF-8 Windows® 874 Windows® 1251 Cyrillic Windows® 1252 Windows® 1254 Turkish Windows® 1258 Vietnamese
Protocols	POP3 and IMAP4
Push email	Microsoft® Exchange ActiveSync® (EAS)
Secure email	SSL/TLS, both port methods (POPS/IMAPS) and START-TLS
HTML mail	Yes (read only)

More information:

[www.sonymobile.com/developer](http://www.sonymobile.com/developer)

[www.openmobilealliance.org](http://www.openmobilealliance.org)

## **Positioning – location based services**

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Supported standards:

- OMA Secure User Plane Location (SUPL) v1.0
- 3GPP™ Control Plane location (including Emergency location) - only support E911.

## **Provisioning (OMA CP)**

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OMA CP version 1.1

## Multimedia (audio, image and video)

Audio Playback	Decoder format	Supported in file format
	Audio decoding MPEG-1/2/2.5, audio layer 3	MP3 (.mp3), 3GPP (.3gp), MP4 (.mp4, .m4a)
	AAC, AAC+, eAAC+	3GPP (.3gp), MP4 (.mp4)
	AMR-NB, AMR-WB	3GPP (.3gp), AWB (.awb), AMR (.amr)
	General MIDI (GM)	SMF (.mid)
	Linear PCM 16 bit	WAV (.wav)
	Ogg vorbis	Ogg vorbis (.ogg)
Audio Recording	Encoder format	Supported in file format
	AMR-NB, AMR-WB	3GPP (.3gp), AWB (.awb), AMR (.amr)
	AMR-NB, AMR-WB, AAC-LC stereo  Sample rate: 48 kHz Bit rate: 160 kbps	3GPP (.3gp), MP4 (.mp4)
Image Playback	Decoder format	Supported in file format
	1, 4, 8, 16, 24 and 32 bpp and RLE encoded formats	BMP (.bmp)
	Single and multi-frame, bitmap mask support (GIF87a format and GIF89a format)	GIF (.gif)
	Joint Photographic Experts Group	JPEG (.jpg)
	Portable Network Graphics Bitmap mask support	PNG (.png)
Image Capture	Encoder format	Supported in file format
	Joint Photographic Experts Group	JPEG (.jpg)
Video Playback	Decoder format	Supported in file format
	MPEG-4 Visual Simple Profile	3GPP (.3gp), MP4 (.mp4)
	H.264	3GPP (.3gp), MP4 (.mp4)
	H.263 Profile 0	3GPP (.3gp), MP4 (.mp4)

Video Recording	Encoder format	Supported in file format
	- Video H.263 Profile 0, H.264 Baseline Profile - Audio: AAC-LC stereo Sample rate: 48 kHz Bit rate: 160 kbps AMR-NB	3GPP (.3gp), MP4 (.mp4)
Audio/Video Streaming	Streaming transport	RTSP according to 3GPP™ HTTP streaming

## Synchronisation (OMA DS, EAS)

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OMA Data Synchronisation protocol versions 1.1.2 and 1.2

OMA Data Formats: vCard 2.1, vCalendar 1.0

Microsoft® Exchange ActiveSync® protocol version 2.5

Microsoft® Exchange ActiveSync® protocol version 12.0

Microsoft® Exchange ActiveSync® protocol version 14.0

Microsoft® Exchange ActiveSync® protocol version 14.1

Related information:

[www.sonymobile.com/developer](http://www.sonymobile.com/developer)

## Web browser

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Browser version	Android 4.2.2 Browser (Based on WebKit™)
Navigation/rendering	Full page PC rendering Landscape/portrait rendering Pan & Zoom
Search	Internet search
Browser compliancy	CSS 2.0 CSS 2.1 CSS 3.0 DOM 2.0 DOM 3.0 HTML version 4.0 HTML version 5.0 V8 JavaScript Engine/ECMA-script 262 5rd edition XHTML Basic version 1.0 XHTML 1.1
Supported Device API	Geo-location API
Protocol compliancy	Gzip HTTP/1.1 OMA Download 1.0 TLS 1.0 and SSL 3.0

Related information:

[www.sonymobile.com/developer](http://www.sonymobile.com/developer)



## Memory in Android™ Device

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To use Android devices efficiently, users should be aware of the different types of device memory. This knowledge is important in order to understand, for example, where music, photos and videos are saved; how many apps can be downloaded from Android Market; and how photos can be copied to a PC.

The below information is also of interest to developers who want to optimise their programs to make the best possible use of the resources in the device.

Generally, all Android devices share the same basic memory setup. What differs is how much memory is available to you via the different types of memory, and whether your device uses an external SD card or an internal memory chip. Any information specific to the particular device model described in this White Paper is noted as such.

### Types of memory

The types of memory described and numbered below are consistent with the terminology used in Sony mobile device menus and in other content relating to 2013 Xperia™ devices:

1. Dynamic Memory (also known as RAM) is used by applications that run when the device is turned on. The amount of Dynamic Memory influences how many applications and operating system services can run at the same time. The Android operating system automatically closes applications and services that are not being used.

However, such automatic functionality has limits. For example, if a lower amount of free RAM is available to applications after a new release of the operating system (due to increased capabilities in the system), device speed will eventually be impacted. This is the main reason that a device cannot be indefinitely upgraded to newer releases of Android™.

If you experience problems with RAM, for example, if the device runs slower than usual or if the Home application restarts frequently when you leave an application, you should minimise the use of apps that run all the time. Such apps could include, for example, applications that frequently download social networking service updates. You could also consider using a static wallpaper instead of a live wallpaper.

To see which apps and services are currently active, go to Settings > Applications > Running Services. You should have at least 50 MB, and ideally 100 MB or more, of free RAM to avoid slowdowns and application restarts.

You should also be aware that if you update the device to a later Android release, the load on the built-in Dynamic Memory will increase due to the addition of more features, as mentioned above. As a result, the device may run slower after an update.

The Xperia™ C has about 1 GB of RAM available to the Android OS and applications, of which about 200 MB is already used out of the box.

2. System Memory (also known as “System partition” or “/system”) is used for the Android OS and for most applications that are pre-loaded from the factory. This type of memory is normally locked, and can only be changed through a firmware upgrade. There is usually some free space available in this section of memory. However, since it is locked, you cannot save apps, photos or any other content to this memory. System Memory is reserved for future firmware upgrades, which almost always need more memory than the original firmware. You cannot see or influence the use of this memory.
3. Internal Storage is memory used as “working” memory. It can be compared to the C: drive on a PC or to the startup disk on a Mac.

This type of memory is used to store all application downloaded from the Google Play™ Store (and other sources) as well as their settings and data (such as emails, messages and calendar events, for example). All applications have an allocated area which no other applications can access and where the application data can be stored.

Some game applications also store content such as game music and game level information outside their own designated area. In most cases, an application can choose to save its data in a location of its own choosing (outside the protected application settings area). Generally, such content is not deleted when an application is uninstalled; it must be removed manually by connecting the device to a computer with a USB cable, or by using a file manager application.

Internal Storage is also used for all user content added, for example, as a result of the user taking photos with the camera, downloading media files, and performing file transfers. Typical user content includes:

- photos
- movies
- music
- downloaded documents (as email attachments, for example)

Internal Storage will tend to fill up as a result of normal usage. Examples of such usage are the saving of data by applications; the downloading and installation of new applications; the downloading of free or paid content; and the shooting of pictures and movies. Therefore, the larger this memory is from the start, the more applications you can download and use, and the more pictures and movies you can shoot.

If the Internal Storage starts to get full, the device slows down, and in some cases it might no longer be possible to install more apps. You should always ensure that you have at least 100 MB of free Internal Storage. If not, you should consider removing some apps that you seldom use, or move content that you do not frequently access to safe storage.

You can see approximately how much Internal Storage is free under Settings > Storage > Internal Storage. You can also view more detail about how much memory is used by various applications under Settings > Applications > Manage Applications. In the Xperia™ C, about 2 GB of Internal Storage is available out of the box.

Please note that in Sony Mobile 2013 products, “Internal Storage” is now the combination of what was previously known as “Device Memory” (for applications and their data – also previously known as “/data”) and “Internal Storage” (for user’s content – also previously known as “/sdcard”). The reason for this change is to make the use of available memory more flexible, and also to enable the optional encryption of user’s content.

#### Memory card slot

In some products you may find both a large internal memory and a memory card reader slot. However, on the current Android platform, the card reader slot does not work in the same manner in a device with a large internal memory as it does in a device with ONLY a memory card slot.

Generally, since most applications expect only a single location for storage, such applications will not generally allow you to SAVE anything to the memory card (i.e., they do not offer the option to choose a storage location). However, some applications (for instance, the Sony Mobile “Camera” application) may actually allow you to do so. Other applications, for example, backup applications such as the Sony Mobile “Memory” application, will by definition be configured to copy content from the Internal Storage to the external SD card.

On the other hand, when it comes to reading from an external SD Card, you will be able to access content (for example, videos, photos and music) on a memory card inserted in this slot without any special consideration since the Android system searches all available memory for content. Therefore, such products may be regarded as supporting a fourth type of memory, called “External Card” or “SD Card”.

4. SD Card (known as “/ext\_card” from a programmer’s point of view, or by other names in other Android products) is the name for the removable SD memory card in all 2013 Sony Mobile products. As described above, this External Card memory is generally more limited in that any application can read from it, but many applications cannot save to this card. Only a few applications, including backup applications and file manger applications, have the capability to save to this card.

#### Backing up data to different memory types

Generally, you should not save photos, videos and other personal content solely on the internal memory of a device. If something should happen with the hardware, or if the device is lost or stolen, the data stored on the device’s internal memory is gone forever.

In a device where an SD card reader is the main memory, it is relatively easy to take the card out and copy all content to a PC or Mac, or to an entertainment device with a memory card slot. In a product featuring Internal Storage as the main memory, it is not possible to physically remove the memory. Instead, any critical or high-value content must either be copied to an external SD card by a special backup application, transferred to remote storage over a network (mobile or Wi-Fi), or to a computer via a USB cable.

To facilitate the transfer of data via a cable, the Xperia™ C supports the Microsoft standard, Media Transfer Protocol (MTP), which makes it possible to easily transfer content back and forth between your device and a Windows PC. For Apple Mac computers, a special application called Sony™ Bridge for Mac is available with built-in support for MTP. This application can be downloaded from the Xperia™ C Support page.

Note that you do not need to back up or make a copy of applications that you have downloaded from the Google Play™ Store. They can normally be downloaded again after you have set up your Google account to work in a new device (or in a device where the memory has been completely erased).

#### Note 1:

As noted above, some Android devices, including Sony Mobile devices from 2012 and Sony Ericsson devices from 2011 and earlier, do not use a single “Internal Storage” for both applications (and their data) and user content. Instead, these devices use either an external SD card for user content, or a corresponding area of internal memory to reproduce the functionality of an SD card. In such devices, there is a fixed limit between the application area (“/data”) and the user content area (“/sdcard”), with the result that user content can build up and reach this limit. The consequence of such a limit being reached, for example, for the camera application, would be that no new pictures could be taken even if there was still a considerable amount of free space in the application area (or in the user content area). In such an instance, the download and installation of new applications would also not be possible, even if there was enough free memory in the content area.

#### Note 2:

Some devices with integrated storage have abandoned the distinction between the application area and the content area when it comes to a Factory Data Reset. As a result, there is no option in such devices to perform a Factory Data Reset and preserve content. In such devices, all content is mandatorily and completely deleted from the device when a reset is performed.

In contrast, Sony Mobile’s memory integration solution makes it possible to preserve user content in this situation. Therefore, when performing a Factory Data Reset, the default action will still be to only remove applications and their data, and an option box must be checked if all content is to be removed as well (as might be desirable when selling the device second-hand, for instance).

**Note 3:**

For a developer, it is important to note that from a programming point of view the location names used to refer to the different memory areas described in Note 1 are still valid, i.e., the area used for applications (“/data”) is still present, as is the area used for content (“/sdcard”).

In reality, “sdcard” is a so-called “symbolic link” to “/data/media”. However, from inside an Android application, “/sdcard” can still be used. For example, you can use “sdcard/DCIM/100Android” to find all camera images. The continued use of “/sdcard” to access the content area ensures compatibility across different products and Android releases in this regard.

## Trademarks and acknowledgements

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